

REMARKS

By the present Amendment, Table 1 has been amended so that one value has been revised so that it is consistent with the description provided on page 46, last line. In addition, claim 1 has been amended to define one aspect of the present invention with greater particularity consistent with teachings of the specification, such as on page 9, line 7.

Prior to discussing the specific reasons as to why applicants believe that the claims now of record are patentable over the cited prior art, applicants believe a discussion of the present invention and the advantageous results which may be obtained therefrom is in order. More specifically, as explained in the paragraph bridging pages 2 and 3 of the present application, in a typical conventional process for making polythiourethane resin by polymerizing polythiol and polyiso(thio)cyanate, the polythiourethane resin is prepared such that the molar ratio of mercapto group to iso(thio)cyanato group is 1. It has been found that when the molar ratio is greater than 1 (i.e., excess mercapto group is used relative to the iso(thio)cyanato group), the heat resistance of the resin is adversely affected and the resin may not be used as optical elements, such as plastic lenses.

The present invention seeks to obtain a high-refractive index resin, which retains an adequate level of heat resistance. Such substantial advantages have been made in accordance with the present invention which in one aspect provides a composition containing a polythiol compound having a dithioacetal, dithioketal, orthotrithioformic ester or orthotetrathiocarbonic ester skeleton and at least two mercapto groups and which further contains a compound having at least two

iso(thio)cyanato groups. The molar ratio of the mercapto groups to the iso(thio)cyanato groups is greater than 1.01, but not more than 3.0.

The advantages which can be obtained in accordance with the present invention are illustrated in the results provided in Table 1. In particular, as may be seen from the illustrative Examples, one can advantageously obtain a high refractive index without a substantial adverse effect on heat resistance. In contrast, when one considers Comparative Examples 1, 3, 5, 6 and 7, which use SH/NCO molar ratios below the claimed range, the refractive index is substantially less. In this regard, it is to be understood that a small difference in refractive index has a substantial effect on lens thickness. Since the edge of a lens for glasses is preferably as thin as possible in view of aesthetics, higher refractive index lenses are in demand. For a -6 D (diopter) lens (medium level of refractive index), an increase of refractive index by 0.04 leads to a decrease in lens thickness of 1 percent. When applied to higher refractive index lens, a greater effect will be obtained.

A further significance point in Table 1 relates to the results provided with respect to Polythiol Compounds C and D. Such polythiol compounds are outside the scope of the polythiol compounds defined in the claims of record. For these polythiol compounds, when one uses a SH/NCO molar ratio within the claimed range, a substantial decrease in heat resistance occurs relative to the examples where the molar ratio is 1.00. Thus, those of ordinary skill in the art will recognize that the presently claimed invention provides the substantial advantageous results of higher refractive index and good heat resistance when the claimed polythiol compounds are present in the defined molar ratio range.

With the foregoing discussion and the results provided in the specification in mind, applicants respectfully submit that the claims now of record are neither anticipated nor rendered obvious by the prior art of record, particularly published European Patent Application No. 1,138,670. The '670 publication relates to a polythiol, polymerizable composition, resin and lens. The polythiol compounds which can be used in the composition are set forth in paragraph [0021] and include the two compounds referred to in the Official Action, but also include many compounds which do not meet the polythiol compound defined in the claims of record. The '670 publication further describes the reaction with iso(thio)cyanates, (thio)epoxy compounds and compounds having an intermolecular unsaturated group which can react with a mercapto group in paragraph [0025]. However, the '670 publication does not teach the molar ratio defined in the claims of record and does not in anyway recognize that by using the defined polythiol compound and the claimed molar ratio, one can obtain a resin with a high refractive index that can exhibit acceptable heat resistance.

As further evidence of the failure of the '670 publication to disclose or suggest the presently claimed invention, the ratio of mercapto to iso(thio)cyanato group in Examples 5-12 have been calculated (Examples 1-4 describe the preparation of the polythiol compounds) and the results are as follows:

Example No. in EP 1,138,670	Ratio of mercapto to iso(thio)cyanato group
5	0.999
6	0.997
7	0.999
8	0.997
9	0.996
10	0.997
11	1.003
12	1.000

As may be seen therefrom, all of the Examples of the '670 publication are outside of the range set forth in the claims of record. Moreover, none of these examples in anyway recognizes that a higher refractive index can be obtained while maintaining heat resistance, as can be obtained in accordance with the present invention. Thus, it is apparent that the presently claimed invention marks a substantial advance in the art and applicants accordingly request reconsideration and allowance of the present application.

Should the Examiner wish to discuss any aspect of the application, he is invited to contact the undersigned attorney at the number provided below.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

By: Robert G. Mukai
Robert G. Mukai
Registration No. 28,531

P.O. Box 1404
Alexandria, Virginia 22313-1404
(703) 836-662

Date: September 27, 2006